DUMP-POINT SAFETY

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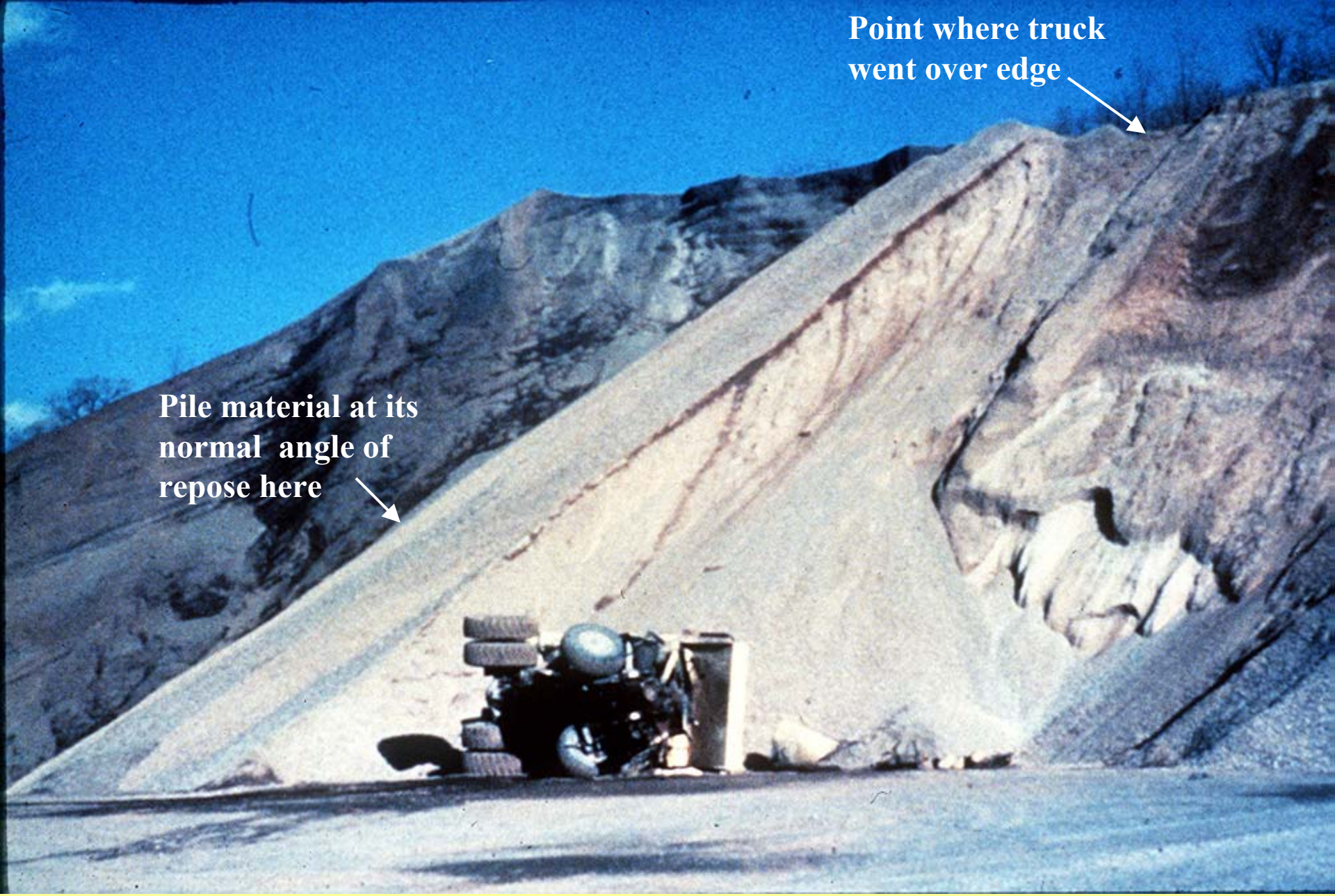
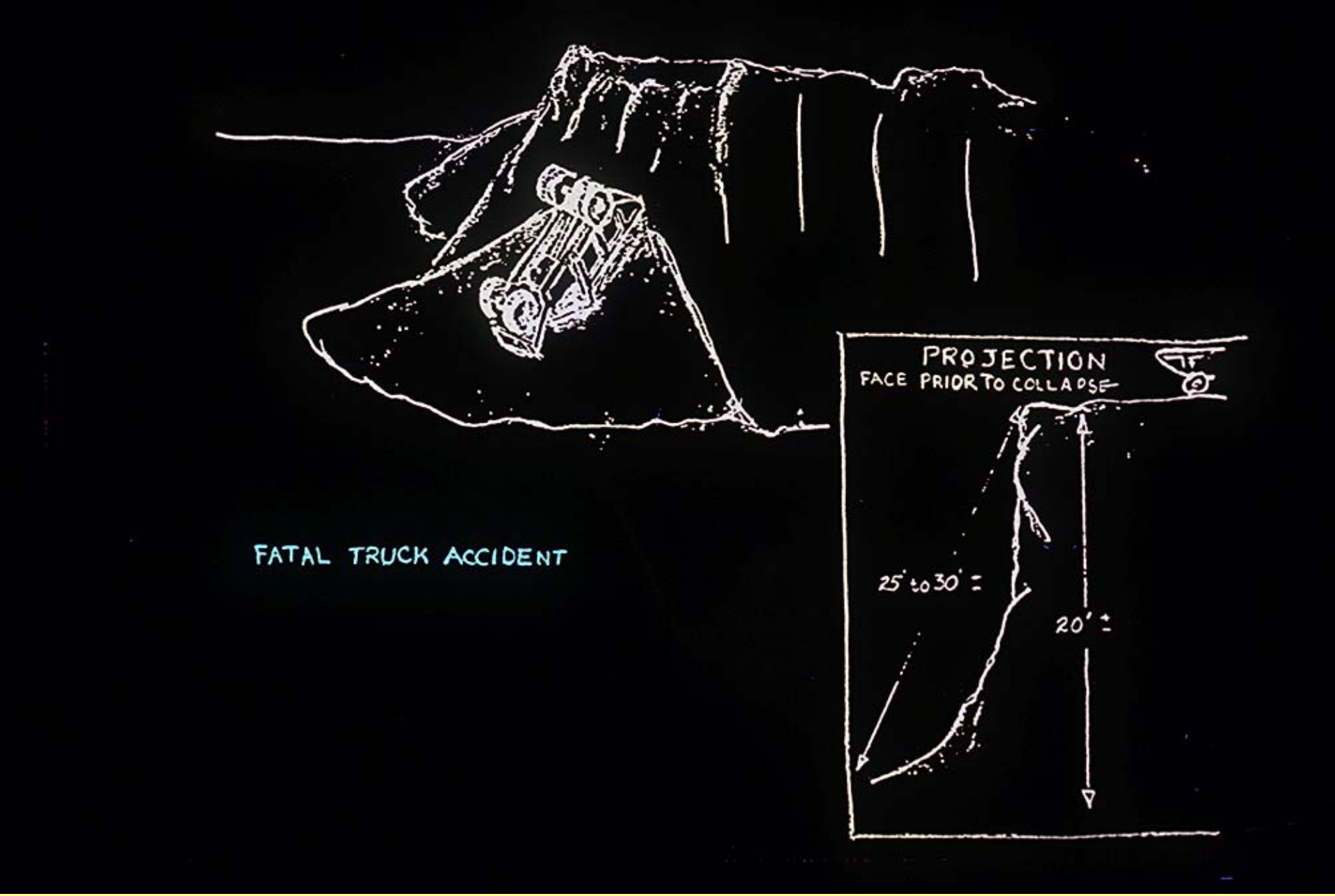
M.S.H.A.

Trucks dump near the edges of stockpiles and spoil piles thousands of times a day in the mining industry.

In the 1990s, 25 miners died when their trucks went over the edge at dump points...



In this accident the pile was 70 feet high pile. Where the truck went over the edge, the pile had been loaded out and made steeper than the material's normal angle of repose. This is a common feature in many dump-point accidents.



In this fatal accident, the pile was only 20 feet high - so it's not just the higher piles that you need to be concerned with...

Remember that in a stockpile or spoil pile, the material is:

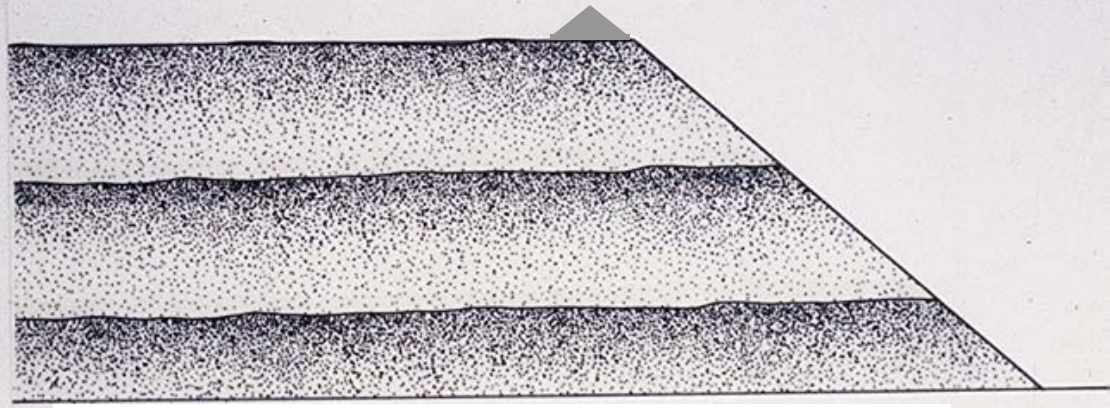
- loosely placed;
- in relatively thick layers; and
- at the material's angle of repose.

As a result, the edge of the pile is barely stable.

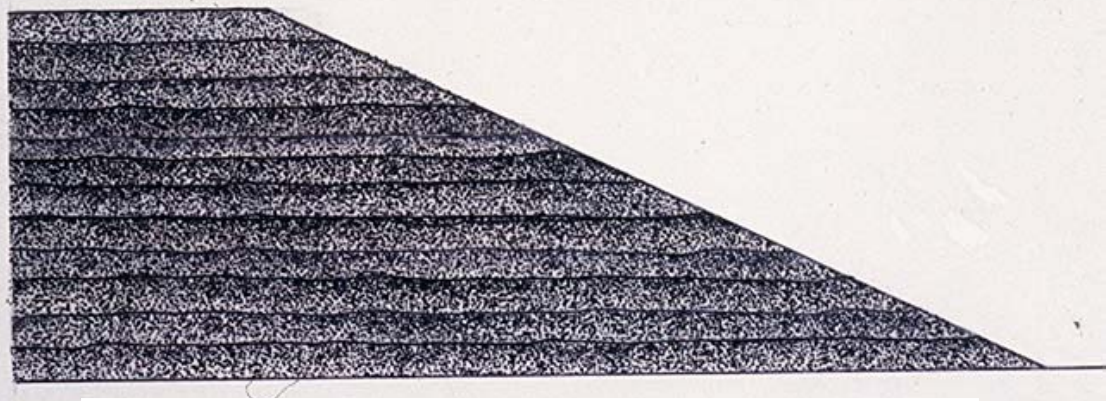
By contrast, a highway embankment would be constructed:

- in thin, well compacted layers; and
- with a relatively flat outer slope.

These differences illustrate why heavy equipment must be operated with great caution near the edge of a stockpile or spoil pile.



STOCKPILE OR SPOIL PILE



HIGHWAY EMBANKMENT

Another important point is that in a typical haul truck like this one, two-thirds of the loaded weight is on the rear axle. A 50-ton capacity truck might have a gross weight of about 90 tons when loaded. Two-thirds of that weight, or 60 tons, would be on the rear axle as the truck backs near the edge of a pile.

Dump-Point Practices

- Maintain adequate berms

The heavy weight of the truck acting near the edge of the pile shows why having an adequate berm is so important.

The berm must serve the functions of :

- Providing the truck driver with a good visual indicator of the location of the edge of the pile;
- Providing restraint to the vehicle from going over the edge.

As illustrated here, another important function of the berm is to have a wide enough base to keep the heavy loading on the rear tires from getting too close to the edge of the pile - where the material could give way.

Dump-Point Practices

- Maintain adequate berms
- Prior to dumping, check the dump area for cracks and other potential problems.

Equipment operators need to be alert for the presence of tension cracks. A crack is an indication that the slope has moved. If the material is having trouble holding up it's own weight, the added weight of a haul truck may cause the material to slide.

Dump short of cracks near the edge of a slope or of areas where the berm is not at least mid axle-height. Mark or barricade these areas to prevent others from being exposed to hazardous conditions. Correct the situation by carefully pushing down the potentially unstable material and establishing an adequate berm...

Preferably cracked or unstable material is pushed down using a track-mounted piece of equipment, as shown here.

Some operations “drive left” on piles so that on the approach the driver is in a better position to observe the dump area and to check for cracks or for an inadequate berm.

Dump-Point Practices

- Maintain adequate berms
- Prior to dumping, check the dump area for cracks and other potential problems.
- Don’t dump above an area where the pile has been loaded-out, or otherwise made steeper than the material’s normal angle of repose.

Loading out from the toe of stockpiles removes material that was supporting the slope, makes the remaining slope steeper and less stable, and can undercut the berm at the top of the pile.

With the pile loaded out and the berm undercut, it’s obvious that it would be highly dangerous to back a haul truck near this area...

Yet conditions like these that have been involved in many of the accidents. In a spoil pile, a condition similar to this could be created by a slide below the dumping point.

If there is uncertainty about the safety of a dump point for any reason --

- **Dump short and push the material over, or**
- **Dump at the base of the pile, or**
- **Dump and load-out in separate locations.**

DUMPING SHORT - Here's an example of dumping inside the berm...

Then pushing the material over the edge.

DUMPING SHORT - Here's another example. In this case the toe of the pile is being loaded out, and the truck dumps back from the edge. A good rule of thumb is to dump one-truck-length back from the edge.

And the material is pushed over by a dozer.

DUMPING AT BASE OF A STOCKPILE. Keeps the truck drivers from being exposed to the unsafe area at the top of the pile. When loading a customer, a good practice used at some operations is to use the first bucket of material to block the stockpile's access ramp. This prevents trucks from going to the top of the pile until the loader operator ensures that over-steepened material has been pushed down and an adequate berm is in place.

SEPARATE DUMPING AND LOADING. Here, the dumping and loading activities are separated. Once the top surface had been covered, the piles will be struck and another layer added.

More on Dump-Point Practices

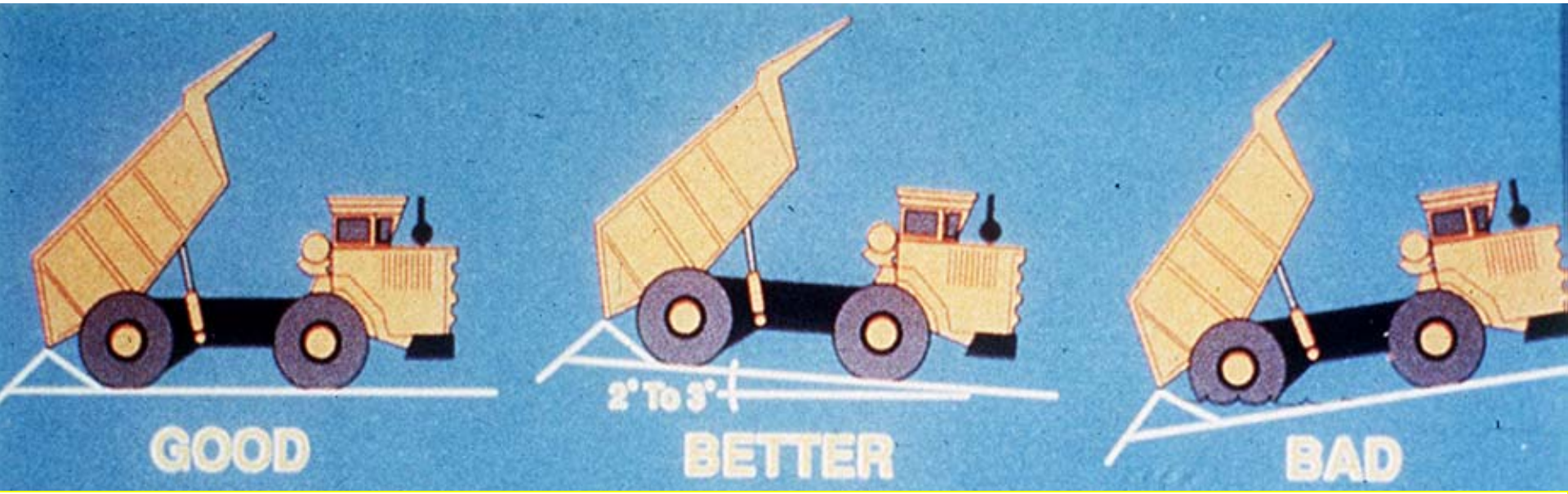
- Use the berm as a visual indicator for where to stop. Do not routinely use it, or rely on it, to help stop the truck.

Near the edge of a pile, trucks should back slowly and come to a gradual stop. Putting on the brakes abruptly imposes additional downward and outward forces that could help cause the edge to give way. Drivers should use the berm as an indicator for where to stop, rather than...

Hitting into and riding up on the berm. The truck could go through the berm (especially if the berm has been undercut), or the extra force could cause the edge to give way.

More on Dump-Point Practices

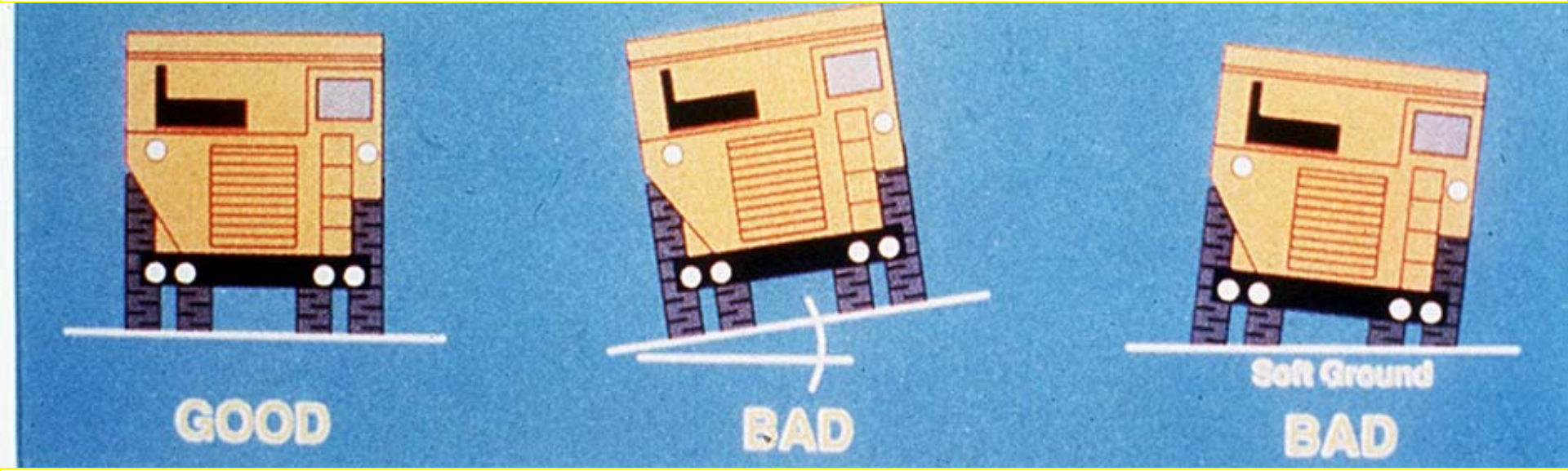
- Use the berm as a visual indicator for where to stop. Do not routinely use it, or rely on it, to help stop the truck.
- Keep the dump area properly graded.



Grade the dump area so that trucks are backing up a slight grade to dump.

This has the advantages of:

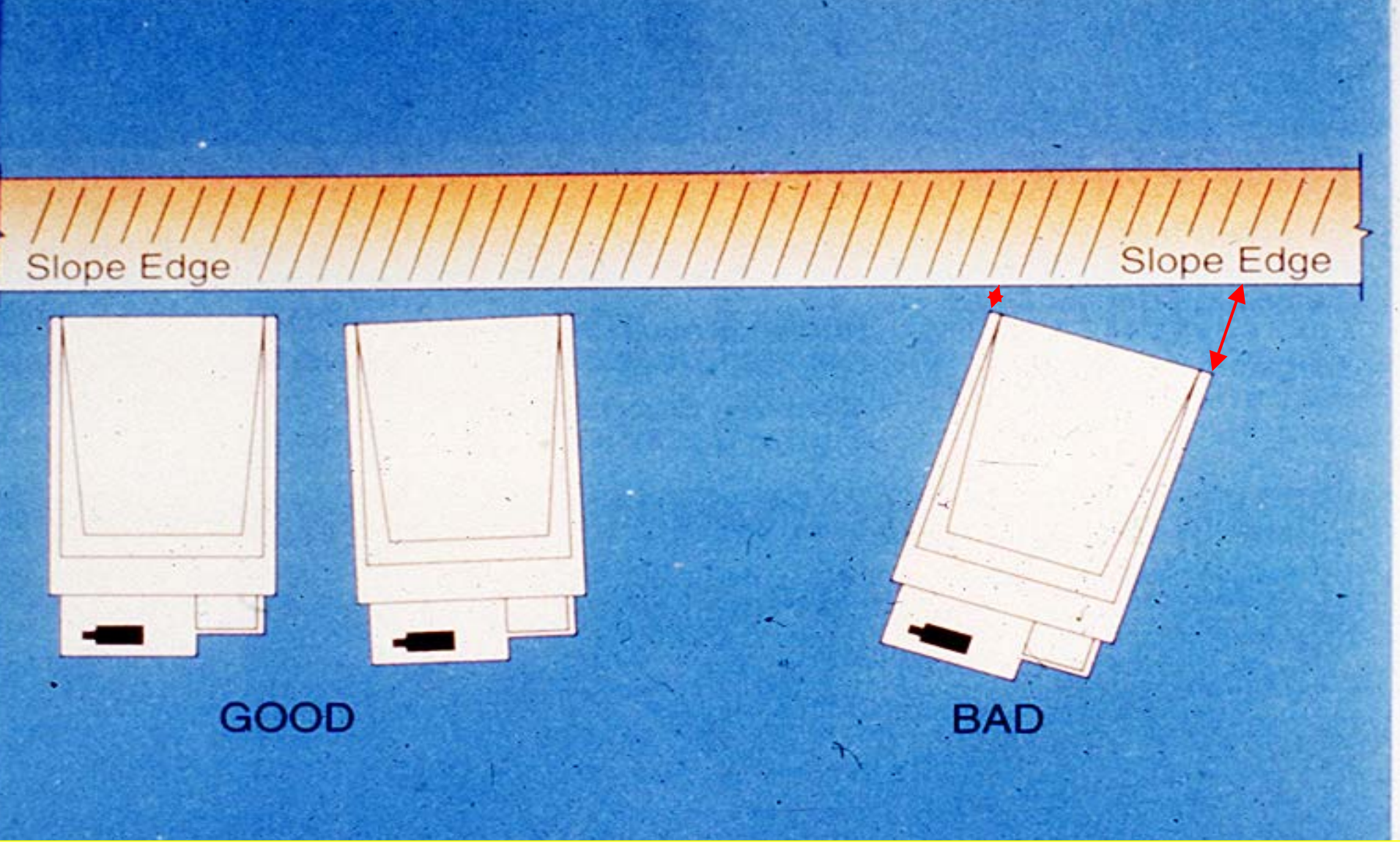
- providing the driver with better control as the truck is backed to the the dump point;
- putting the truck in a better position to be pulled forward if a problem develops, and
- keeping the dump area better drained.



Keeping the dump area graded level from side-to-side, and free of soft spots, will help prevent trucks from tipping over as the bed is raised. This is particularly a concern in cases where material sticks in the truck bed.

More on Dump-Point Practices

- Use the berm as a visual indicator for where to stop. Do not routinely use it, or rely on it, to help stop the truck.
- Keep the dump area graded properly.
- Back perpendicular to the berm - not at an angle.



Back trucks square to the edge of the slope as shown on the left. In many dump-point accidents, it is found that the truck had been backed as shown on the right. In these cases, the longer distance to the berm on the driver's side may lead the driver to power the opposite-side rear tires through the berm.

Here’s an accident where a truck went over the edge of this spoil pile and the tire tracks are at an angle to the edge of the pile.

This is where that truck ended up, with fatal injuries to the driver.

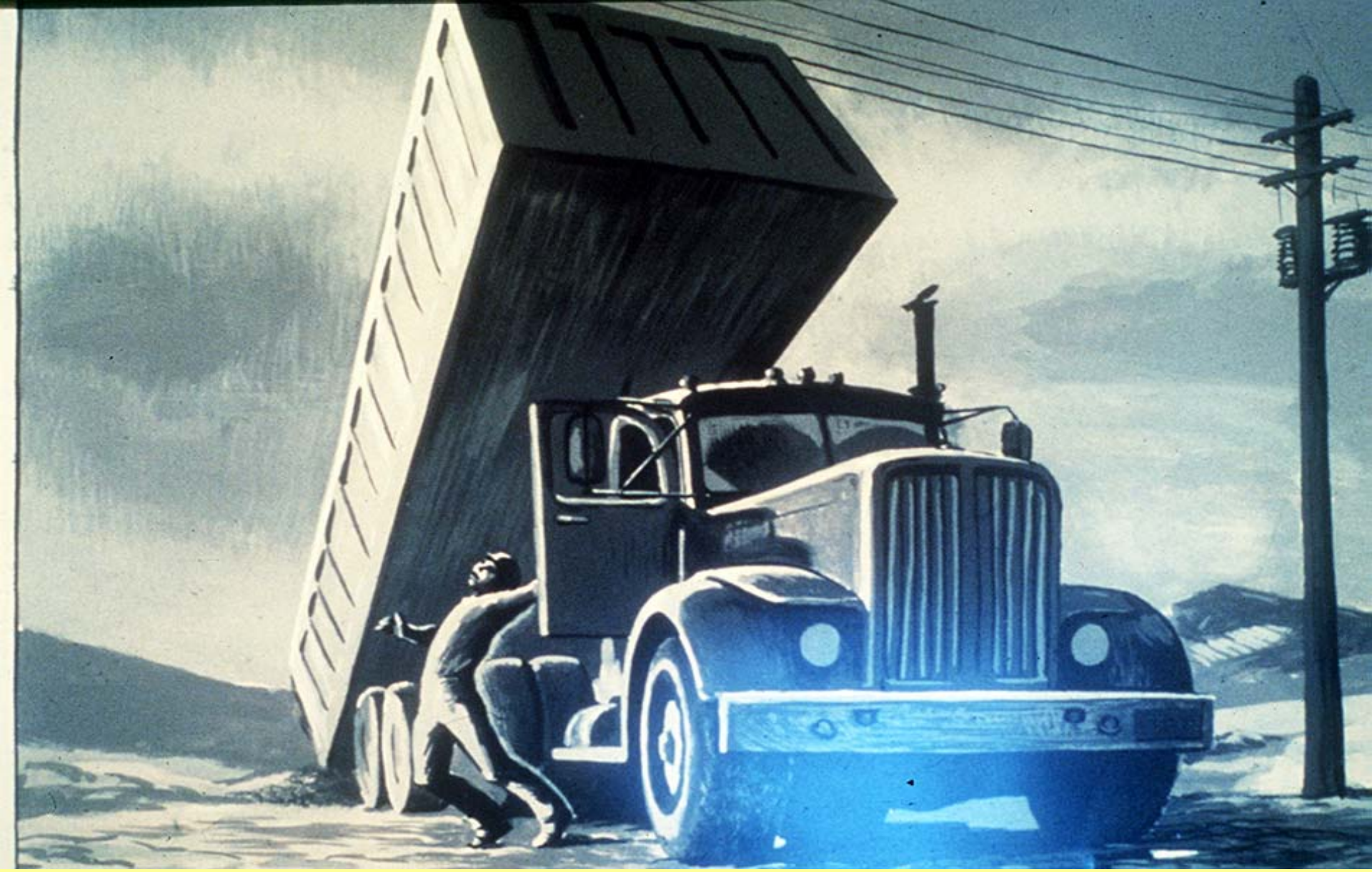
OTHER DUMP-POINT HAZARDS…

- Working at night or in poor visibility conditions.

Provide sufficient lighting so that hazardous conditions, such as cracks or inadequate berms, can be detected during night operations. When visibility is poor, a good practice is to dump back from the edge.

OTHER DUMP-POINT HAZARDS…

- Powerlines.



Best Practice is to locate any type of dump point away from power lines or to have the power lines high enough that they are safely above even the raised-bed height of the haul trucks. Power lines can also be marked to make them more conspicuous.

MSHA Handbook Series

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Mine Safety and Health Administration
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DUMP-POINT INSPECTION HANDBOOK

For more detailed information on dump-point safety, consult MSHA's "Dump-Point Inspection Handbook." Lists of recommended "Best Practices" from this handbook, broken down for "Mine Operator," "Truck Driver," "Dozer Operator," and "Front-End Loader Operator," are shown in the following slides.

Appendix D. Dump-Point Safety: Best Practices

The attached list entitled "Dump-Point Safety: Best Practices" may be useful for inspectors or mine personnel in giving a brief safety talk on dump-point safety or to quickly review the main safety points covered in this handbook.

DUMP-POINT SAFETY: BEST PRACTICES

I. MINE OPERATORS:

Best Practices for ***mine operators*** at dump points are to:

< Provide training to dump-point workers on recognizing dump-point hazards, taking appropriate corrective measures and using safe dumping procedures.

< Supervise dumping operations regularly to ensure that unsafe conditions are being corrected and safe practices are being followed.

< Instruct dozer operators to maintain adequate berms, keep the dump properly graded, and correct or barricade unsafe dump areas.

< Avoid the hazards associated with dumping near the edge of a pile by routinely dumping back from the edge and pushing the material over, preferably with a track-dozer.

< Dump directly over the edge of a pile ONLY when all proper safety precautions are taken. These include ensuring that close supervision is provided; a berm with sufficient height and base-width is maintained; and truck drivers are well-trained on the potential dangers.

DUMP-POINT SAFETY: BEST PRACTICES

I. MINE OPERATORS - continued

- Instruct truck drivers to always dump a truck-length back from the edge in areas where the berm is inadequate or where the dump area is cracked, settled, or too soft.

- Instruct truck drivers to always dump a truck-length back from the edge if the pile below the dump point has been loaded-out and over-steepened.

- Establish procedures for stockpiles that prevent the possibility of trucks attempting to dump above a point where the pile has been loaded-out and over-steepened. Methods to do this are to dump a truck length back from the edge or to block the pile's access ramp during loading operations.

- Route truck traffic so that drivers have the best opportunity to routinely observe the condition of the dump area, both above and below the dump point, on their approach.

- Consider the practice of "driving left" on the dump to allow drivers a better opportunity to observe the dump area on the approach.

- Instruct dump-point workers to examine both the top of the pile and the area below the dump point for signs of instability.

DUMP-POINT SAFETY - BEST PRACTICES

I. MINE OPERATORS - continued

- Provide for communication between dump-point workers.
- Provide adequate illumination of the dump-point area for night operations.
- Ensure that the location of overhead power lines does not present a hazard for the trucks. Be especially alert to this problem as the size of stockpiles increases.
- Provide training to truck operators on safe driving procedures, specifically the proper use of the transmission and brakes while backing and dumping the truck.
- Ensure that equipment is properly maintained and that safety features are operational.
- Require customer truck drivers to stay in their cab while being loaded at a stockpile.
- Make use of new technologies such as the use of vehicle-mounted cameras that can improve both dump-point safety and efficiency. A rearward-looking camera, for example, can assist a truck driver in backing up square to the berm and in knowing how close to the berm the vehicle is positioned.

DUMP-POINT SAFETY: BEST PRACTICES

II. TRUCK DRIVERS

Best Practices for ***truck drivers*** at dump points are:

- Check the dump area for unsafe conditions on their approach, staying a truck length back from the edge.

- Dump back from the edge if:

  - the berm is inadequate (for example, the berm is not at least mid-axle height, the berm has been partially undercut, etc.).

  - the area below the dump point has been loaded-out and over-steepened.

  - there are cracks near the edge of a pile.

  - the edge area is soft and the tires sink in.

  - there are signs that the slope below the dump point is unstable.

  - visibility is poor.

- Dump a truck-length back from the edge anytime there is uncertainty about the safety of the dump area.

- Back up perpendicular to the edge or with the driver's-side rear tires leading just slightly.

Dump-Point Safety Best Practices: Truck Drivers - continued...

- Back up slowly and come to a gradual stop at the dumping point.
- Use the berm as a visual guide only. Do not use it routinely to help stop the truck.
- Avoid running the rear tires up on the berm.
- Maintain spacing from other trucks while dumping.
- Do not attempt to dump the material if it sticks in the bed, especially if it sticks after the bed is raised about two-thirds of the way.
- Communicate dump-point conditions to the dump supervisor, the dozer and front-end-loader operators, as well as other drivers.
- Be aware of the proximity of overhead power lines.
- Be sure to lower the bed after dumping.
- Wear your seatbelt.
- Get proper training on safe dumping procedures.

DUMP-POINT SAFETY: BEST PRACTICES

III. DOZER OPERATORS

Best Practices for ***dozer operators*** at dump points are to:

< Maintain adequate berms at the dump points.

< Grade the top of the pile so that trucks are going up a slight grade as they back up to dump and the dump area is kept well-drained.

< Keep the dump area graded so that trucks are not tilting to one side as they back up to dump.

< Keep alert throughout the shift for the development of potentially unsafe conditions such as cracks, settling, or soft areas.

< Correct or barricade potentially unstable areas.

< Remedy steep or overhanging pile slopes by carefully pushing material down from the top of the pile.

< Re-grade soft spots with better material and smooth out rough areas on the dump.

< Act as a spotter for the trucks and keep them back from the edge when conditions warrant.

< Communicate dump conditions to the dump supervisor and the truck drivers.

< Wear your seatbelt.

DUMP-POINT SAFETY: BEST PRACTICES

IV. FRONT-END LOADER OPERATORS

Best Practices for ***front-end loader operators*** working at stockpiles are to:

< Recognize that loading-out material at the toe of a pile affects the safety of the dump point above the load-out area.

< Communicate to company truck drivers and the dump supervisor any questionable dump-point conditions.

< Block off the pile access ramp or barricade the area when trucks would be exposed to dangerous or questionable conditions on the top of the pile.

< Limit the height of the loaded-out and over-steepened portion of the pile to about the reach of their equipment.

< Remedy steep slopes or overhangs before such conditions get high enough to pose a hazard. If necessary, correct such conditions by carefully pushing or dumping material from the top of the pile - preferably using a track-mounted piece of equipment.

< Wear seatbelts.

< Be alert to the dangers of blind spots around their equipment.

< Remind customer truck drivers that they need to stay in their cab while parked near, or being loaded at, a stockpile.

By following the “Best Practices,” these dump-point accidents could have been prevented.

MSHA Mine Safety and Health Administration
Department of Labor

The preceding information is intended solely for the purpose of raising the awareness of dump-point hazards and of measures that can be taken to prevent dump-point accidents. The Federal standards regarding dump-points are contained in 30 CFR Parts 56, 57, 75, and 77.

A complete copy of MSHA's "Dump-Point Inspection Handbook" can be found in the "FOIA Reading Room" on MSHA's web page at www.msha.gov.

The following safety videos are available from the National Mine Health and Safety Academy (304-256-3257):

-- Dump-Point Safety: Stockpiles and Waste Piles, VC-858, 1997, 14 minutes.

-- Good Berms Save Lives, VC-928, 1998, 15 minutes.